

Application No.: 10/814,992
Amendment dated: November 12, 2007
Reply to Office Action of May 10, 2007
Attorney Docket No.: 56229-153 (ANAK-248)

C. REMARKS / ARGUMENTS

1. Allowance of Claims 16, 18, and 20-22

Applicant notes with appreciation that Claims 16, 18 and 20-22 are now allowed.

2. Objection To Claim 1

The Examiner has objected to claim 1 because of an informality

Claim 1 has been amended, in order to make the corrections requested by the Examiner, namely inserting "the x-ray source of" before "the x-ray apparatus.. (See section B above).

Applicant submits that, as a result of these corrections, the Examiner's objection to claim 1 has been overcome.

3. Rejection of Claims 1, 4, 5, and 7-15 Under 35 U.S.C. § (112) 1.2

Claims 1, 4, 5, and 7-15 stand rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner states i.a.: "*Claim 1 recites "a single x-ray image." This limitation contradicts with x-ray images that are acquired using one or more sensors in steps B and D.*"

Applicant respectfully traverses, for the reasons set forth below.

A single image of the target object is generated by irradiating the object with x-rays from the x-ray source during the entire x-ray exposure period, and by detecting with a plurality of sensors the x-rays that passed through the object. The object must be irradiated during the entire x-ray exposure period, in order for the desired single image of the object to be properly generated, by definition. This is set forth in the preamble of claim 1, as well as e.g. in paragraphs [0011] and [0028] (set forth below) of Applicant's application. Any image of the object that is generated by exposing the object to anything less than the x-ray exposure period for that object will be incomplete and / or severely flawed, and does NOT correspond to the "single x-ray image of an object" that is generated in accordance

Application No.: 10/814,992
Amendment dated: November 12, 2007
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Attorney Docket No.: 56229-153 (ANAK-248)

with claim 1.

Contrary to the Examiner's statement reproduced above, neither step B nor step D describes any acquiring of x-ray images. Step B and D recite operating the x-ray apparatus at a first and a second voltage level during sampling intervals that are very small compared to the entire x-ray exposure period, and are located only in the beginning of the exposure period. Also, the x-rays pass through only a portion of the object during these sampling intervals, hence cannot contain any image information regarding the remaining portion of the object. In other words, the information acquired from the x-rays detected during these two sampling intervals is very incomplete, and falls far short of what is necessary to generate the single image of the whole object.

The x-ray image, i.e. the single x-ray image of the entire object, is detected only at the end of the entire x-ray exposure period. See e.g. paragraph [0011] ("A method is provided ... for an x-ray image that is produced by irradiating an object ... with x-rays ... **during an x-ray exposure period**."). In order for a single image of the object to be generated, the object must be irradiated during the entire length of the x-ray exposure period. See e.g. paragraphs [0023] and [0028] ("... The x-ray imaging system ... receive x-rays that have passed through the object ... and generates **an image** of the object 12 from the received x-rays.")([0023]) and ("...the sampling periods are very short, compared to **the x-ray exposure period during which the object 12 is exposed to x-rays** 31 from the x-ray source 14.")([0028]).

No x-ray image is acquired in either step B nor step D. As the name "sampling" interval suggests, a very small sample of the x-rays are detected, during a very short time interval just in the beginning of the x-ray exposure period, for purposes of sampling and not for purposes of generating any proper images. The purpose of detecting x-rays during the very short sampling intervals occurring in step B and step D is simply to find out what the optimal values are for the x-ray exposure parameters that should be set for the duration of the x-ray exposure period, i.e. to predict the optimal x-ray tube settings.

Steps B and D involve defining the optimal x-ray tube settings that would

Application No.: 10/814,992
Amendment dated: November 12, 2007
Reply to Office Action of May 10, 2007
Attorney Docket No.: 56229-153 (ANAK-248)

work best for the entire x-ray exposure period, so as to optimize the quality of the single image of the object is generated at the end of the entire x-ray exposure period, NOT to generate any separate images. See e.g. paragraph [0012] ("... **During at least a first and a second sampling interval in the beginning of the x-ray exposure period, the x-ray apparatus is operated at the first and second kVp levels The sensor output signals are then processed, in order to determine the optimal value of the operating voltage, as well as the optimal values of one or more additional x-ray exposure parameters (e.g., mA, focal spot size, soft x-ray filter parameters) of the x-ray apparatus. The x-ray exposure parameters are set to these optimal values, for the remainder of the x-ray exposure period.** More specifically, the purpose of detecting x-rays during the very short sampling intervals during step B and step D is to. See e.g. paragraph [0036]

Contrary to the Examiner's statement ("Claim 1 recites "a single x-ray image". This limitation contradicts with x-ray images that are acquired using one or more sensors in steps B and D"), nowhere in claim 1, or elsewhere in the present patent application, is there any teaching or suggestion of images being acquired in steps B and D. No images are acquired during steps B and D. Rather, during steps B and D the x-ray source is operated during first and second sampling intervals (that are very short compared to the x-ray exposure period) in the very beginning of the x-ray exposure period, in order to determine the optimal parameters to which the x-ray tube should be set, during the remainder of the x-ray exposure period.

Applicant has further amended claim 1 to make it clear that the a single x-ray image is an image of the entire object, and not an image of just a portion of the objection. (See amendment to section E of claim 1:

E. after said second sampling interval Δt_2 , processing the sensor output signals to determine an optimal value kVp_2 for the operating voltage level, and setting the operating voltage level of the x-ray source of the x-ray apparatus to said optimal value kVp_2 for the remainder of the x-ray exposure period of the single image of the entire object.) No new matter is introduced by this amendment, support for

Application No.: 10/814,992
Amendment dated: November 12, 2007
Reply to Office Action of May 10, 2007
Attorney Docket No.: 56229-153 (ANAK-248)

which can be found throughout the specification, as well as the figures of Applicant's application.

Applicant has further amended claim 1 to make it clear that "the x-ray exposure period is a length of time during which said object must be irradiated with the x-rays in order for said single x-ray image of said object can be generated," and that "the object is irradiated with x-rays from the x-ray apparatus during said x-ray exposure period to generate said single image of the object." No new matter is introduced by these amendments, support for which can be found throughout the specification, as well as in the preamble of claim 1.

Applicant therefore respectfully submits that the above-described amendments to claim 1 overcome the above §112 ¶ 1 rejection to these claims, as well as the §112 ¶ 1 rejection to claims 4-5 and 7-15 (all of which depend claim 1)

4. Rejection of Claims 1, 2, 7, 8, and 11-15 under 35 U.S.C. § 102(b)

Claims 1, 2, 7, 8, 11, and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 6,501,819 to Unger et al. ("Unger"). Applicant respectfully traverses.

Applicant has previously amended independent claim 1 to recite that a single x-ray image is produced by irradiating the object during an x-ray exposure period, and to clarify that the x-ray exposure period recited in claim 1 (and claims dependant thereon) relates to a single x-ray image. In section 3 above, Applicant has explained why such an amendment render claim 1 invalid under 35 USC 112, and why such a limitation does not contradict anything in steps B and D of claim 1, because steps B and D disclose sampling x-rays from the x-ray source during very short time intervals ("sampling periods") in order to determine the optimal x-ray parameters, and NOT to generate any images that are separate and distinct from the single image of the object that is generated by irradiating the object during the x-ray exposure period.

Accordingly, Applicant submits that Applicant's amendment to claim 1 relating to generating "a single x-ray image" of an object is proper and supported

Application No.: 10/814,992
Amendment dated: November 12, 2007
Reply to Office Action of May 10, 2007
Attorney Docket No.: 56229-153 (ANAK-248)

by the specification, and does not render claim 1 invalid under 35 USC 112.

In the present Amendment and Response, Applicant has further amended claim 1 to recite that 1) the x-ray exposure period is a length of time during which said object must be irradiated with the x-rays in order for said single x-ray image of said object can be generated, that 2) the object is irradiated with x-rays from the x-ray apparatus during said x-ray exposure period to generate said single image of the object, and that the single image is an image of the entire object. These amendments are supported by the specification and figures, as explained above in section 3.

As previously acknowledged by the Examiner in the previous Office Action, Unger "disclosed a method of adjusting exposure settings that comprises determining an operating voltage level based on a previous image and setting the operating voltage level of the x-ray source for the next image." In other words, Unger discloses adjusting exposure settings by determining and setting operating voltage levels for a next image, based on a previous different image.

Unger does not disclose determining and setting operating voltage levels for an image, based on that same image. More specifically, Unger does not disclose determining, during an x-ray exposure period for a single x-ray image of an object, first and second operating voltage levels for that same single x-ray image, and operating at these first and second operating voltage levels during a same x-ray exposure period of the same single x-ray image of that same object, as required by amended claim 1.

Accordingly, Applicant submits that independent claim 1, as currently amended, is allowable, and not anticipated by Unger.

Claims 2, 7, 8, 11, and 15

Claims 2, 7, 8, 11, and 15 all depend on claim 1, and therefore include all the limitations of claim 1. Claims 2, 7, 8, 11, and 15 are therefore also not anticipated

Application No.: 10/814,992
Amendment dated: November 12, 2007
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Attorney Docket No.: 56229-153 (ANAK-248)

by Unger.

5. Conclusion

On the basis of the foregoing amendments, Applicant respectfully submits that all of the pending claims are in condition for allowance. An early and favorable action is therefore earnestly solicited. If there are any questions regarding these amendments and remarks, the Examiner is encouraged to contact the undersigned at the telephone number provided below.

Respectfully submitted,

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